

Nov. 15, 1927.

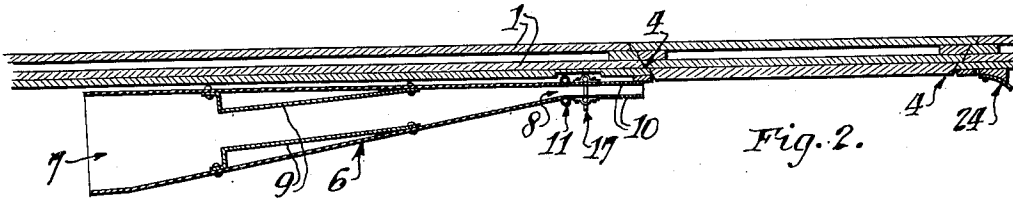
1,649,290

A. W. DE NEEN

REFRIGERATOR

Filed March 9, 1926

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

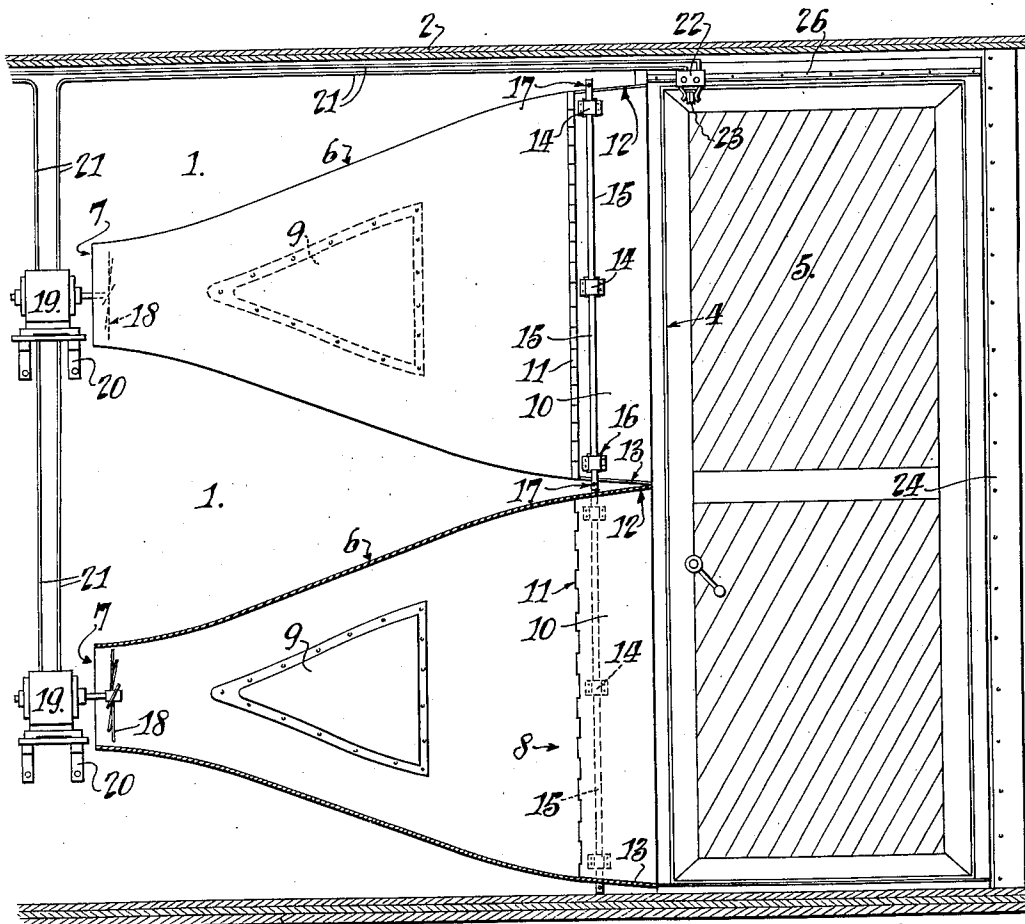


Fig. 3.

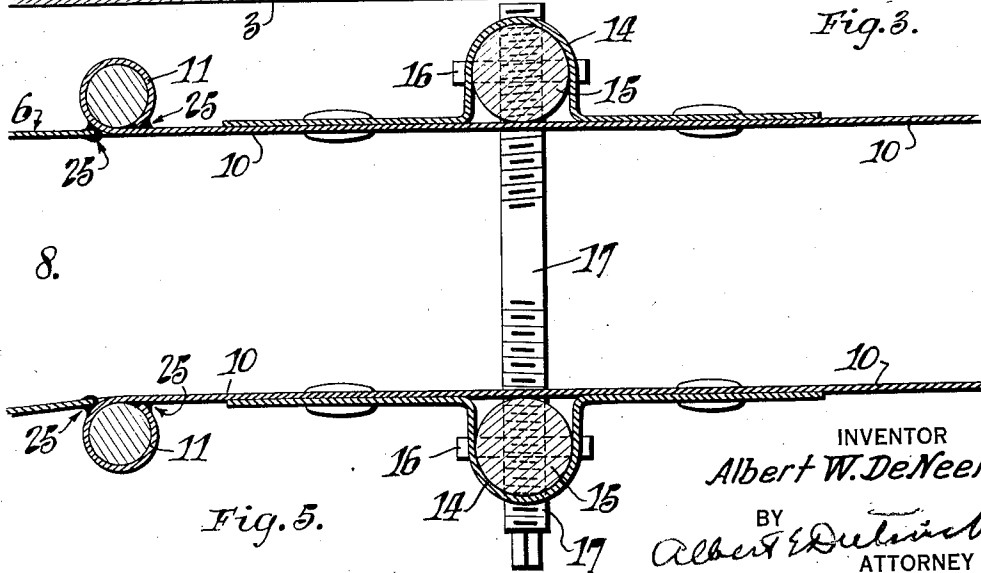


Fig. 5.

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UNITED STATES PATENT OFFICE.

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REFRIGERATOR.

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My invention relates to the art of refrigeration and more particularly to the means for preventing the entrance of warm air into a refrigerator upon opening the door. It is a known fact that a body will continue in its present state, whether in motion or at rest, until acted upon by some greater extraneous force; proceeding upon this principle my invention in its generic nature provides a means to generate and project a continuous curtain of air rapidly across the doorway of a refrigerator upon opening the door.

More specifically the invention includes means controlling the generation and projection of the air-curtain by the position of the refrigerator door itself; still more specifically the invention includes the utilization of the chilled air within the refrigerator for the production of the curtain.

In other words, the invention comprises a mechanical device placed within the refrigerator, and, using the cold air of the refrigerator chamber, produces and directs a dense rapidly moving sheet or layer of air against the refrigerator door opening when the door is opened, thus eliminating substantially all loss of cold air.

In its yet more specific nature the invention furthermore includes those novel details of construction, combination and arrangement of parts, all of which will be first fully described, and then specifically pointed out in the appended claims, reference being had to the accompanying drawings, in which:—

Figure 1 is a vertical longitudinal section of a portion of a refrigerator looking from the inside toward the wall having the door opening, a small size refrigerator using only one shaper unit being shown.

Figure 2 is a horizontal section on the line 2—2 of Figure 1.

Figure 3 is a view similar to Figure 1 showing the invention on a larger refrigerator employing a plurality (in this instance two) of shaper units.

Figure 4 is an enlarged detail elevation of a portion of the invention.

Figure 5 is a horizontal section on the line 5—5 of Figure 4.

Referring in detail to the accompanying drawings in which like numerals of reference indicate like parts in all the figures, 1 is the front wall of a refrigerator. The

construction of the refrigerator may be as usual and per se constitutes no part of the present invention. 2 is the top and 3 the bottom of the refrigerator while 4 indicates the door opening or doorway. The door is represented by 5.

Mounted within the refrigerator on the front wall 1 are shaper units, the number employed depending upon the size of the refrigerator or rather the size of the refrigerator door opening. In the first embodiment of my invention illustrated in Figure 1 I have shown but a single shaper unit while in Figure 3 I have shown a plurality of shaper units. Each shaper unit comprises a body 6 having an entrant throat 7, preferably cylindrical, and an outlet end 8, the latter being flattened or fan-like to shape the cylindrical column of air entering the body 6 into a flat sheet or layer where it leaves the body.

9 are dividers located within the body 6 and shaped to divide the incoming air and cause it to distribute evenly in its flow toward the exit end, the shapers being designed to cause a one-third of the air to flow upwardly, another third to flow downwardly and the remainder to flow straight ahead, and in this way assists in maintaining an equal density of the air-curtain as it issues from the exit or outlet end 8. The outlet end 8 is provided with lips 10 which are hinged at 11, the body 6 having top and bottom extensions 12 and 13 between which the lips are located.

Adjusting rod bearings 14 are carried by the lips and support the adjusting rods 15, the latter being held from longitudinal movement by cross pins 16. The rods 15 may turn on their axes in the bearings 14 to a limited extent with respect to the lips and are connected top and bottom by adjusting screws 17 having right and left threads whereby on turning the screws in one direction the lips are spread apart or separated, and upon turning the screws in the opposite direction the lips are brought closer together at their outer edges in order to thicken or thin the air-curtain issuing from between the lips.

18 is a blower or air fan located within the cylindrical entrance of the shaper body and the blower 18 is driven, preferably, by an electric motor 19 that is suitably supported at 20 and to which the current supply

or circuit wires 21 connect. A control switch 22 is connected in the circuit with the motor and has spring contacts normally tending to engage one another to close the circuit, (the switch may be of any approved construction and per se forms no part of the invention). On the door is placed a control switch point separator 23 which, when the door is closed, opens the circuit at the switch and prevents operation of the motor, but which as soon as the door has been moved slightly to open, disengages itself from the control switch points which thereupon come together, closes the circuit and permits operation of the motor.

The shaper unit or units are so located that their outlet ends parallel one edge of the door opening and discharge the air-curtain adjacent thereto. On the side of the door opening opposite the shaper units is placed a deflector strip 24 against which the air-curtain impinges and by which it is deflected back into the interior of the refrigerator.

All joints of the shaper, hinges, and the top and bottom of the lips will be sealed with a flexible sealing compound of rubber that will prevent escape of air and will not hinder the adjustment of the lips. This compound is indicated by 25.

From the foregoing it will be observed that the dividers are shaped and placed on the two side walls of the shaper device in such manner as to divide the air into thirds (as heretofore stated) sending one-third to the top, another third to the bottom and permitting the remaining third to pass unhindered, thus giving a uniform pressure to the full height of the shaper at the lips. The shaper is also so constructed that there is a slight squeeze of the air as it approaches the lips, that is, the cross section areas of the shaper gradually diminish from the blower to the lips thus gaining velocity and providing a more dense body of air; proper allowance is, of course, made for the space that the dividers take up.

By regulating the position of the lips through the adjustment screws the thickness of the air-curtain may be regulated to attain the best results.

In order to keep the air-curtain intact as it passes across the door opening a shield 26 is provided across the top of the doorway. This shield extends laterally a distance sufficient to project over the thickness of the air-curtain.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the construction, operation and advantages of the invention will be clear to those skilled in the art to which it appertains.

What I claim is:

1. In a refrigerator having a door open-

ing and a door associated therewith, means to form air into a sheet or curtain coextensive with the door opening and directly across the door opening within the refrigerator, and means wholly located within the refrigerator to gather and force the air within the refrigerator through the forming and directing means, said door opening outwardly thereby preventing loss of air incidental to opening of the door.

2. In a refrigerator having a door opening and a door, means to form air into an uninterrupted sheet or curtain coextensive with the door opening and directed across the door opening within the refrigerator, and means wholly within the refrigerator to gather and force the cold air exclusively from within the refrigerator through the forming and directing means across the doorway parallel and adjacent thereto.

3. In a refrigerator having a doorway and a door, means to form air into a sheet or curtain and direct it across the doorway, means to gather and force the air through the forming and directing means, and means to deflect substantially all the air of the curtain back into the body of the refrigerator after it has passed the doorway.

4. In a refrigerator having a doorway and a door, means to form air into an uninterrupted curtain or sheet coextensive with the door opening and direct it across the door opening, and means wholly within the refrigerator to gather and force air exclusively through the forming and directing means, and means controlled by the door for setting said gathering and forcing means into and out of action accordingly as the door is opened or closed.

5. In refrigerators having a doorway and a door; a shaper located adjacent the doorway, a blower within the shaper for taking air from within the refrigerator and forcing it directly through the shaper and across the door opening as an uninterrupted curtain coextensive with the door opening, a motor driving the blower, and means governed by the door for effecting operation of said blower.

6. In refrigerators having a doorway and a door; a shaper located adjacent the doorway, a blower for taking air from within the refrigerator and forcing it through the shaper and across the door opening as a curtain coextensive with the door opening, a motor driving the blower, said shaper comprising a tubular body having an entrance in which the blower is located, said body extending toward the door opening and being flattened toward its outlet end to deliver the air as an uninterrupted sheet or curtain across the door opening coextensive with said opening.

7. In refrigerators having a doorway and a door; a shaper located adjacent the door-

way within the refrigerator, a blower for taking air from within the refrigerator and forcing it through the shaper and across the door opening as a curtain, a motor driving the blower, said shaper comprising a tubular body having an entrance in which the blower is located, said body extending toward the door opening and being flattened toward its outlet end to deliver the air as a sheet or curtain across the door opening, a divider within said tubular body to distribute the air from the blower evenly along the outlet end of the shaper, whereby the air curtain issuing therefrom will be of substantially equal density throughout its area.

8. In refrigerators having a doorway and a door; a shaper located adjacent the doorway, a blower for taking air from within the refrigerator and forcing it through the shaper and across the door opening as a curtain, a motor driving the blower, said shaper comprising a tubular body having an entrance in which the blower is located, said body extending toward the door opening and being flattened toward its outlet end to deliver the air as a thin uninterrupted sheet or curtain across the door opening, and means governed by the door for effecting operation of said blower.

9. In refrigerators having a doorway and a door; a shaper located adjacent the doorway, a blower for taking air from within the refrigerator and forcing it through the shaper and across the door opening as a curtain, a motor driving the blower, said shaper comprising a tubular body having an entrance in which the blower is located, said body extending toward the door opening and being flattened toward its outlet end to deliver the air as a sheet or curtain across the door opening, a divider within said tubular body to distribute the air from the blower evenly along the outlet end of the shaper, whereby the air curtain issuing therefrom will be of substantially equal density throughout its area, and means governed by the door for effecting operation of said blower.

10. In refrigerators having a doorway and a door; a shaper located adjacent the doorway, a blower for taking air from within the refrigerator and forcing it through the shaper and across the door opening as a curtain, a motor driving the blower, said shaper comprising a tubular body having an entrance in which the blower is located, said body extending toward the door opening and being flattened toward its outlet end to deliver the air as a sheet or curtain across the door opening, said shaper including adjustable lips, and means to adjust said lips to narrow or widen the outlet of the shaper, thereby to diminish or increase the thickness of the air curtain accordingly as said lips are adjusted.

11. In refrigerators having a doorway and a door; a shaper located adjacent the doorway, a blower for taking air from within the refrigerator and forcing it through the shaper and across the door opening as a curtain, a motor driving the blower, said shaper comprising a tubular body having an entrance in which the blower is located, said body extending toward the door opening and being flattened toward its outlet end to deliver the air as a sheet or curtain across the door opening, a divider within said tubular body to distribute the air from the blower evenly along the outlet end of the shaper, whereby the air curtain issuing therefrom will be of substantially equal density throughout its area, said shaper including adjustable lips, and means to adjust said lips to narrow or widen the outlet of the shaper, thereby to diminish or increase the thickness of the air curtain accordingly as said lips are adjusted.

12. In refrigerators having a doorway and a door; a shaper located adjacent the doorway, a blower for taking air from within the refrigerator and forcing it through the shaper and across the door opening as a curtain, a motor driving the blower, said shaper comprising a tubular body having an entrance in which the blower is located, said body extending toward the door opening and being flattened toward its outlet end to deliver the air as a sheet or curtain across the door opening, and means governed by the door for effecting operation of said blower, said shaper including adjustable lips, and means to adjust said lips to narrow or widen the outlet of the shaper, thereby to diminish or increase the thickness of the air curtain accordingly as said lips are adjusted.

13. In refrigerators having a doorway and a door; a shaper located adjacent the doorway, a blower for taking air from within the refrigerator and forcing it through the shaper and across the door opening as a curtain, a motor driving the blower, said shaper comprising a tubular body having an entrance in which the blower is located, said body extending toward the door opening and being flattened toward its outlet end to deliver the air as a sheet or curtain across the door opening, a divider within said tubular body to distribute the air from the blower evenly along the outlet end of the shaper, whereby the air curtain issuing therefrom will be of substantially equal density throughout its area, and means governed by the door for effecting operation of said blower, said shaper including adjustable lips, and means to adjust said lips to narrow or widen the outlet of the shaper, thereby to diminish or increase the thickness of the air curtain accordingly as said lips are adjusted.

14. In refrigerators having doorways and

outwardly opening doors, means for producing a flowing sheet of chilled air across the doorway within the refrigerator upon opening the door, said means including a shaper, a blower and a driving motor, said shaper comprising a body having an approximately cylindrical entrance and a flattened elongated spreader portion for shaping the air column into a thin flat sheet or curtain, said blower being located in said cylindrical entrance.

15. In refrigerators having doorways and doors, means to produce a flowing curtain of chilled air across the doorway upon partially opening the door, said means including a shaper, a blower and a driving motor, and a door operating controller for the motor, said door opening outwardly thereby preventing loss of air incidental to the opening of the door.

16. In refrigerators having door openings and doors, a shaper for refrigerator air-curtain production comprising a tubular body having an inlet throat and a fanlike flattened outlet portion to receive air and form it into a sheet or curtain, lips at said outlet portion hinged to said body, means to adjust said lips to thicken or thin the air curtain according to the adjustment of said lips, said shaper including a flat side lying in close proximity to the wall of the refrigerator adjacent the door opening.

17. In refrigerators having door openings and doors, a shaper for refrigerator air-curtain production comprising a tubular body having an inlet throat and a fan-like flattened outlet portion to receive air and form it into a sheet or curtain, lips at said outlet por-

tion hinged to said body, means to adjust said lips to thicken or thin the air curtain according to the adjustment of said lips, said means comprising bars carried by the lips and screws connecting the bars opposite one another.

18. In combination with a refrigerator having a chamber with a door opening and a door, means located adjacent one edge of the door opening and coextensive therewith for forming air into a thin sheet and directing it edgewise across the door opening, parallel and adjacent thereto, and means to gather air within the chamber and force it through the forming and directing means, said gathering and forcing means being wholly located within the chamber whereby the air constituting the curtain is gathered from and remains within the chamber, said door opening outwardly thereby preventing loss of air incidental to opening of the door.

19. In refrigerators having a door and door opening outwardly, means to produce a continuous sheet of chilled air across, parallel to and coextensive with the door opening, said means including a blower, a shaper for reducing the air column from the blower to a thin flat sheet of relatively great density, and a driving motor to operate said blower to impel said sheet with considerable velocity across the door opening, whereby said sheet will maintain a substantially uniform thickness until it has passed the door opening, and means for intercepting said sheet after it has passed the door opening to deflect it inwardly within the refrigerator.

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